Burrows Graham

Renshaw House, Manchester

Drainage Strategy

for

MIA JAMES
CONSTRUCTION & INTERIORS

Ref: 30094-BGL-XX-XX-RP-C-00002

Version 4
6th November 2024

DOCUMENT CONTROL SHEET

Issued by: Burrows Graham Limited
5 Ambassador Place
Stockport Road
Altrincham
WA15 8DB

Tel: +44 (0)161 804 8046

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Prepared		Jack Lee	
Checked		Jack Williams	
Approved		Jack Williams	

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Version Number	**Date**	**Revision Details**
1	22.01.2023	**DRAFT FOR COMMENT**
2	12.04.2024	**DRAFT FOR COMMENT – UPDATED DEVELOPMENT INFORMATION**
3	16.05.2024	**UPDATED SITE LAYOUT**
4	06.11.2024	**UPDATED SITE LAYOUT**

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CONTENTS

1.0 PROJECT BACKGROUND

2.0 SITE DETAILS

3.0 FLOOD RISK STATEMENT

4.0 SURFACE WATER DRAINAGE STRATEGY

5.0 FOUL WATER DRAINAGE STRATEGY

6.0 MITIGATION / MANAGEMENT OF FLOOD RISK

7.0 CONCLUSION

APPENDICES

APPENDIX A DEVELOPMENT SITE, GROUND FLOOR AND ROOF PLANS

APPENDIX B TOPOGRAPHICAL SURVEY

APPENDIX C UTILITIES SURVEY

APPENDIX D DRAINAGE STRATEGY

APPENDIX E HYDRAULIC CALCULATIONS

APPENDIX F DRAINAGE INSPECTION & MAINTENANCE SCHEDULE

FIGURES

Figure 1 – Development Ground Floor Plans (APPENDIX A) 4
Figure 2 - Development Roof Plan (APPENDIX A) 4
Figure 3 - Site Location Plan - Google Earth Image 2024 6

TABLES

Table 1 - Site characteristics 5
Table 2 – Detailed SuDS Hierarchy review 9
Table 3 - Foul drainage discharge rate 11

1.0 - PROJECT BACKGROUND

1.1 - Appointment

Burrows Graham Limited have been commissioned by 'Mia James Construction & Interiors' (referred to the as 'the applicant' hereafter) to undertake a drainage strategy of suitable scope to support a planning application for a proposed Student Residential building on the junction of Plymouth Grove and Hyde Grove, Manchester.

1.2 - Aim of study

This Drainage Strategy has been developed in due cognisance of all relevant available policy information. It is anticipated that this report will satisfy the requirements of the National Planning Policy Framework (NPPF) and all relevant flood risk planning policies.

1.3 - Relevant policy and strategy documents

A full planning application is being submitted on behalf of the applicant for the 0.14ha site at the junction of Hyde Grove and Plymouth Grove Street.

The development will be a re-purpose of the existing site for a Purpose-Built Student Accommodation (PBSA) providing a high-quality development. Renshaw House is on the existing site which will need to be demolished and the PBSA erected in its place.

The proposed development comprises a 4-floor (5-storey) building with; en-suite bedrooms, kitchen and dining spaces, a communal social space, vehicular access, disabled access, bike storage, courtyard and public amenity areas, plant and servicing and a social space with frontage on to Hyde Grove.

There are 76 proposed studio units and each has a shower, toilet, and sink.

The proposed development will utilise green roofs, permeable paving and is surrounded on two sides by soft landscaping.

The development can be classed as:

- 'Very low risk' in accordance with the 'gov.uk' website for Flood risk from surface water and Flood risk from rivers of the sea.
- 'Less vulnerable' in accordance with guidance set out on the 'gov.uk' website, namely 'Table 2: Flood vulnerability classification'.
- 'Not within a Critical Drainage Catchment' as defined in the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA Critical Drainage Areas.

Figure 1 – Development Ground Floor Plans – P09 (APPENDIX A)

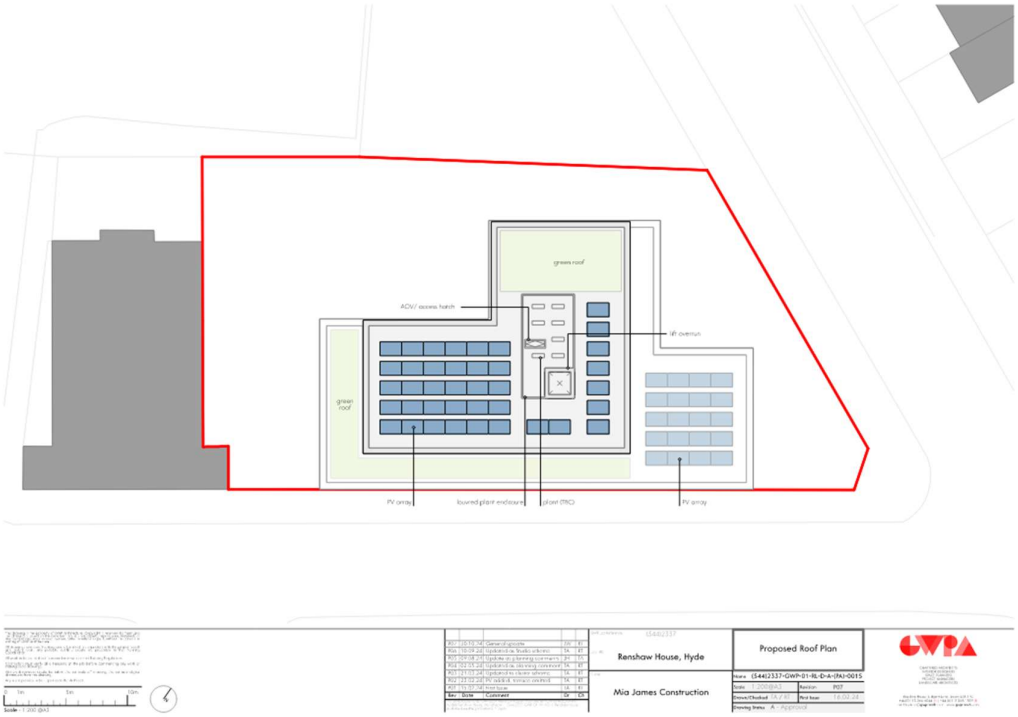

Figure 2 - Development Roof Plan - P07 (APPENDIX A)

2.0- SITE DETAILS

2.1- Site description

Table 1 - Site characteristics

Site address	Renshaw House, Manchester, Hyde Grove, Brunswick, Chorlton-on-Medlock, Manchester M13 9LQ
Grid reference	SJ 85330 96380
Area (hectares)	The site boundary has been measured to be 0.14 hectares.
Usage	PBSA
Surroundings	The site is located in south-east Manchester. - To the north-east, the boundary is defined by Plymouth Grove, A5184 and beyond the A-road there is a number of residential plots for c. 400m. - To the south-east the boundary is defined by Hyde Grove where the development will be accessed. Beyond Hyde Grove there are a number of apartment blocks and Swinton Grove Park is c.120m away. - To the south-west, the boundary is defined by Hyde Grove Chapel 'The Old Church'. - To the west is Manchester Blood Donor Centre, beyond this is Upper Brook Street, A34 which leads north to Manchester Ring Road. - To the north-west is also Manchester Blood Donor Centre, Manchester Central Ambulance Centre and their ancillary carpark. - The wider landscape comprises of commercial and residential building, mainly hardstanding roads with scattered soft landscaping.
Topography	Site levels are generally flat, all the levels within the existing grass area to the north-east of the site are within the 42.00m to 42.40m AOD range. The site itself is slightly elevated from its surroundings as the footpaths to the north and south-east are around 42.90mAOD. A copy of the topographical survey has been included in APPENDIX B of this report.

Figure 3 - Site Location Plan - Google Earth Image 2024

2.2– Existing drainage

The United Utilities Sewer Records have been displayed in APPENDIX C of this report as part of this report.

In proximity to the development there are only Combined Public Sewers, to the north, in Plymouth Grove and to the east in Hyde Grove.

The Combined Sewer in;

- Plymouth Grove, to the north, takes sewage from east to west under Plymouth Grove then north up Leigh Street to the wider UU network.
- Hyde Grove, to the east, takes sewage south away from Plymouth Grove, under Manchester NHS blood donor car park into the A34, Upper Brook Street to the wider UU network. The head of this run is west of the proposed development, set back from the junction of Hyde Grove and Plymouth Road.

From UU records there is no indication of invert levels however it is assumed these can be connected via gravity connections.

There is a trunk main under Plymouth Grove and the connecting distribution main in Hyde Grove which has a stub into the proposed development with a stop tap adjacent to the Old Church.

2.4 - Geology and hydrogeology

Details below are based on publicly available information at the time of writing this FRA.

The following information has been taken from publicly available information as there hasn't been a ground investigation to date. The British Geological Survey (BGS), GeoIndex Onshore data shows the site is underlain by Sherwood Sandstone Group which may occur as dene sand or extremely weak sandstone, often to depths of tens of meters. The superficial engineering geology is fine layered till. This is firm to very stiff or hard slightly gravelly sandy clay with interbeds of laminated clay/silt and beds/lenses of sand and gravel. Excavations likely

to require immediate support due to water-bearing layers/lenses of silt, sand and gravel. Engineering fill is suitable as general cohesive fill depending on plasticity and water content. Generally, should be placed as soon as possible after excavation and subject to minimum construction traffic when wet. Site Investigation recommended to determine deposit thickness and lithological variation, including the presence of laminated silts and clays and water-bearing sand and gravel layers.

The bedrock engineering geology is Sandstone and Conglomerate/Breccia 8:1. Described as very weak to very strong coarse-grained conglomerate or breccia, comprising rounded or angular clasts of gravel-size or larger in a finer indurated or cemented matrix. May weather to silty, sandy gravels, cobbles or boulders depending on inherent clast size. Permeabilities are variable but may be low to very high flow through matrix and discontinuities. Site investigations are required to confirm whether infiltration at this site is viable, based on the superficial engineering geology it does not appear likely.

2.5- Flood Risk Assessment

Refer to the Flood Risk Assessment, document reference 30094-BGL-XX-XX-RP-D-00001 which has been included in the wider planning application.

3.0– SURFACE WATER DRAINAGE STRATEGY

3.1 – Disposal of surface water

The method for removal of surface water from the site has been selected in accordance with the hierarchy outlined in Building Regulations Part H as summarised below:

- Infiltration to the ground,
- Discharge to a watercourse,
- Connection to a surface water sewer,
- Connection to a combined sewer.

The site is brownfield and based on aerial imagery approximately 65% is built up and hardstanding whereas the remaining 35% is soft landscaped area. An outline assessment of the existing brownfield rates can be estimated using the modified rational method, this is shown below in section '3.6 – Discharge rates'.

3.2 – Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) will be utilised in line with The SuDS Manual (C753) guidance and aim to minimise the impact a development has on the run-off quantity and quality and maximise amenity and biodiversity opportunities.

The management train approach is a fundamental principle of SuDS, it aims to primarily reduce pollution, flow rates and volume of run-off from the site. The main objective is to treat the run-off as close to the source as possible and it is imperative that **at least two** of the following should be included within the drainage strategy.

- **Prevention** – The use of good site design and rainwater re-use measures to prevent run-off.
- **Source Control** – Controlling the run-off as close to source as possible by using; green roofs, permeable pavements and soakaways.
- **Site Control** – Use of water management techniques within local area, i.e. detention basins and geo-cellular storage.
- **Regional Control** – Management of water from a number of sites in a specific location, i.e. balancing ponds and wetlands.

The drainage strategy for this development will incorporate **Source Control**; green roofs and permeable paving and **Site Control**; flow control.

Details of how the SuDS hierarchy have been reviewed are shown in the table below.

Table 2 – Detailed SuDS Hierarchy review

Order of Priority	Sustainable Drainage Measures	Suitability (Y/N)	Comments
1	Store rainwater for later use	N	Discounted – no requirement for ay irrigation within the proposed development.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	N	Discounted – the underlying soil characteristics inhibit using infiltration as a method of disposal i.e. soakaways. Borehole records show a record of firm to very stiff or hard slightly gravelly sandy clay with interbeds of laminated clay/silt and beds/lenses of sand and gravel. Site investigation is required to confirm but unlikely based on lithology.
3	Attenuate rainwater in ponds or open water features for gradual release	N	Discounted – spatial constrains. Filtration and attenuation provided elsewhere – see below.
4	Implement green roofs for water retention	Y	Green roofs to be provided where possible.
5	Attenuate rainwater beneath permeable surfaces such as car parks	Y	Attenuation has been proposed within the granular sub-base, which is to be drained via the surface water network.
6	Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Should the attenuation volumes suggested in #4 and/or the volume of the granular sub-base in #5 not be adequate underground storage may be required.
7	Discharge rainwater direct to a watercourse	N	Discounted – all flows are controlled at source and outfall into the local UU sewer network.
8	Discharge rainwater to a surface water sewer/drain	N	There are no local separate foul or surface water UU sewers, only a combined sewer which will the site will discharge to.
9	Discharge rainwater to the combined sewer	Y	There are no local foul and surface water UU sewers, only a combined sewer which the site will discharge to. Water will discharge to local UU sewers after the flows being controlled on site and surface water passed through a by-pass separator to remove pollutants.

3.3 – General strategy

For details of the outline drainage proposals for the site, reference should be made to drawing (ref: 30094-BGL-XX-XX-DR-S-00250), which has been included in APPENDIX D of this report.

3.4 – Total site area and impermeable areas

The total drained impermeable area of the proposed development has been measured to be 0.14 hectares.

3.5 – Climate Change

In line with the latest Department for Environment Food & Rural Affairs guidance[1] and the Manchester City, Salford and Trafford Councils Level 1 SFRA, a 30% central allowance has been made as there is no recommendation to use an upper end allowance.

3.6 – Discharge rates

The site is considered to be a brownfield development, based on aerial imagery approximately 65% is built up and hardstanding whereas the remaining 40% is soft landscaped area. An outline assessment of the existing brownfield rates can be estimated using the modified rational method, this is shown below.

Total site area = 0.14ha

65% hardstanding = 0.091ha. For comparison the hard standing area being developed is 0.09ha.

The brownfield run-off based on a standard rainfall intensity of 50mm/h (50 x 2.78 x 0.091) is 12.6l/s. Applying a 50% brownfield betterment, in accordance with LFRM policy 6, yields a restricted overall design rate of 6.3l/s.

It is anticipated there will be one combined outfall on site with surface water restricted and a non-return valve prior to the relatively shorty combined run into the local UU sewer.

3.7 – Attenuation storage

In order to achieve the restriction in peak rate of surface water run-off from the developed site as described above, attenuation storage will be required in order to temporarily store the residual volume of surface water for rainfall events resulting in a peak run-off rate over and above 6.3l/s.

Attenuation is to be designed to ensure that there is no surface water flooding on site for rainfall events up to and including the 1 in 30-year storm event. The attenuation storage will be designed to ensure that surface water run-off for storm events up to and including the 100-year storm plus a 30% allowance will not cause a risk of flooding to properties or increase the flood risk outside of the site.

A 30% climate change allowance is proposed in accordance with DEFRA which is based upon the central allowance for a development with an expected design life into 2070s.

Attenuation will be achieved by implementing green roofs, storing rainwater beneath permeable surfaces such as car parks and within sealed tanks beneath the ground for gradual release.

A hydraulic modelling exercise of the proposed drainage system has been undertaken and the results have been included in APPENDIX E of this report.

3.8 – Water quality

Water quality has been considered and the following measures have been included within the surface water drainage proposals:

- All drainage from car park areas, which are considered low risk will pass through either a Class 1 bypass separator or permeable paving prior to discharging to the local combined sewer.

[1] Climate change allowances for peak rainfall in England (data.gov.uk)

- Silt will be prevented from entering the system by the use of channels with silt traps and catch pits where required.

3.9 – Maintenance

Reference should be made to the Drainage Inspection and Maintenance Schedule in Appendix F**Error! Reference source not found.**, which includes required actions and typical frequencies for all drainage infrastructure serving the development.

The drainage will be managed and maintained by an appointed Management Company.

4.0 – Foul water drainage strategy

The only sewer in proximity of the development is a combined United Utilities sewer, therefore the foul shall discharge to this.

The strategy is to combine with surface water on site in a short, combined run with no return valves prior to discharging to the local foul sewer in Hyde Grove.

The foul flows will outfall at an unrestricted rate into this combined sewer and the rate of discharge is to be agreed with UU.

At this stage, an assessment of the anticipated average foul flow from the PBSA has been carried out in accordance with guidance set out in Flows and Loads – 4 (British Water 2013), which stipulates a figure of 100litres/unit/dwelling/day for Students (Accommodation Only). It should be noted that the average foul flows from the residential towers have been increased by 10% to account for student amenity space.

Table 3 - Foul drainage discharge rate

No. dwellings	Foul discharge per day	Foul discharge flow rate
76	8360	0.10 l/s

5.0 - MITIGATION / MANAGEMENT OF FLOOD RISK

5.1– Access and egress

Access to and egress from the site will be provided by one access of Hyde Grove. The whole site is within flood zone 1 therefore safe means of access / egress is available to the site at all times.

5.2 - Drainage & exceedance flow routes

The proposed surface water drainage system will be designed in accordance with the drainage strategy set out in Section 5 of this report. This will ensure that there is no increase in flood risk to the site or elsewhere in the local catchment for all storm events up to and including the 100-year storm plus 30% climate change.

It should be noted that if storm events in excess of the 100-year storm plus 30% climate change or blockages occur, this will result in flood water arising from the site drainage system. If the site drainage system were to flood, it is considered that any surface water arising from the site drainage system would be contained within the overall site boundary.

6.0 – CONCLUSION

This Flood Risk Assessment and Drainage Strategy has concluded that the development is appropriate and can be occupied safely subject to implementation of the flood risk mitigation described in this report being carried out.

APPENDIX A

DEVELOPMENT SITE, GROUND FLOOR PLAN AND ROOF PLANS

KEY

- Studio Bedroom - 2no.
- EA Study Bedroom - 2no.
- Social space - 235m² (2.97m² per bed)
- Circulation Core
- Plant
- Cleaners Store
- Circulation
- Bins
- Cycles Store
- Administration
- Existing Trees
- Root Protection Zone
- Proposed Trees

TOTAL BEDS - 4no

Cycle Parking

Internal secure cycle spaces (double stacked)	36
External enclosed secure cycle spaces (double stacked)	32
Internal secure 'Sheffield Hoop' spaces	4
Internal secure 'EA Cargo bike' spaces	2
External 'Sheffield Hoops' visitor spaces	6
TOTAL Cycle spaces	**80**

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Any discrepancies to be reported to the Architect.

0 1m 5m 10m

Scale - 1:200 @A3

Rev	Date	Comment	Dr	Ch
P09	30.10.24	General update	JW	RT
P08	10.09.24	Updated as Studio scheme	TA	RT
P07	09.08.24	Update as planning comments	JH	TA
P06	08.05.24	Update to suit tree survey	TA	RT
P05	02.05.24	Updated as planning comment	TA	RT
P04	27.03.24	Doors updated to suit levels	TA	RT
P03	21.03.24	Updated to cluster scheme	TA	RT
P02	23.02.24	Cycle parking updated	TA	RT

/Volumes/Data/CAD/(544)2337 Renshaw House, Manchester/A_Architects_(GWP)/Model/Renshaw House, Manchester - (544)2337-GWP-01-XX-M3-A-RenshawHouse-StudioReducedHeightOption2-P10.pln

GWP Job Reference (544)2337

Job Title: Renshaw House, Hyde

Client: Mia James Construction

Proposed Ground Floor Plan

Name	(544)2337-GWP-01-GF-D-A-(PA)-0009
Scale 1:200@A3	Revision P09
Drawn/Checked MH / TA	First Issue 23.02.24
Drawing Status	A - Approval

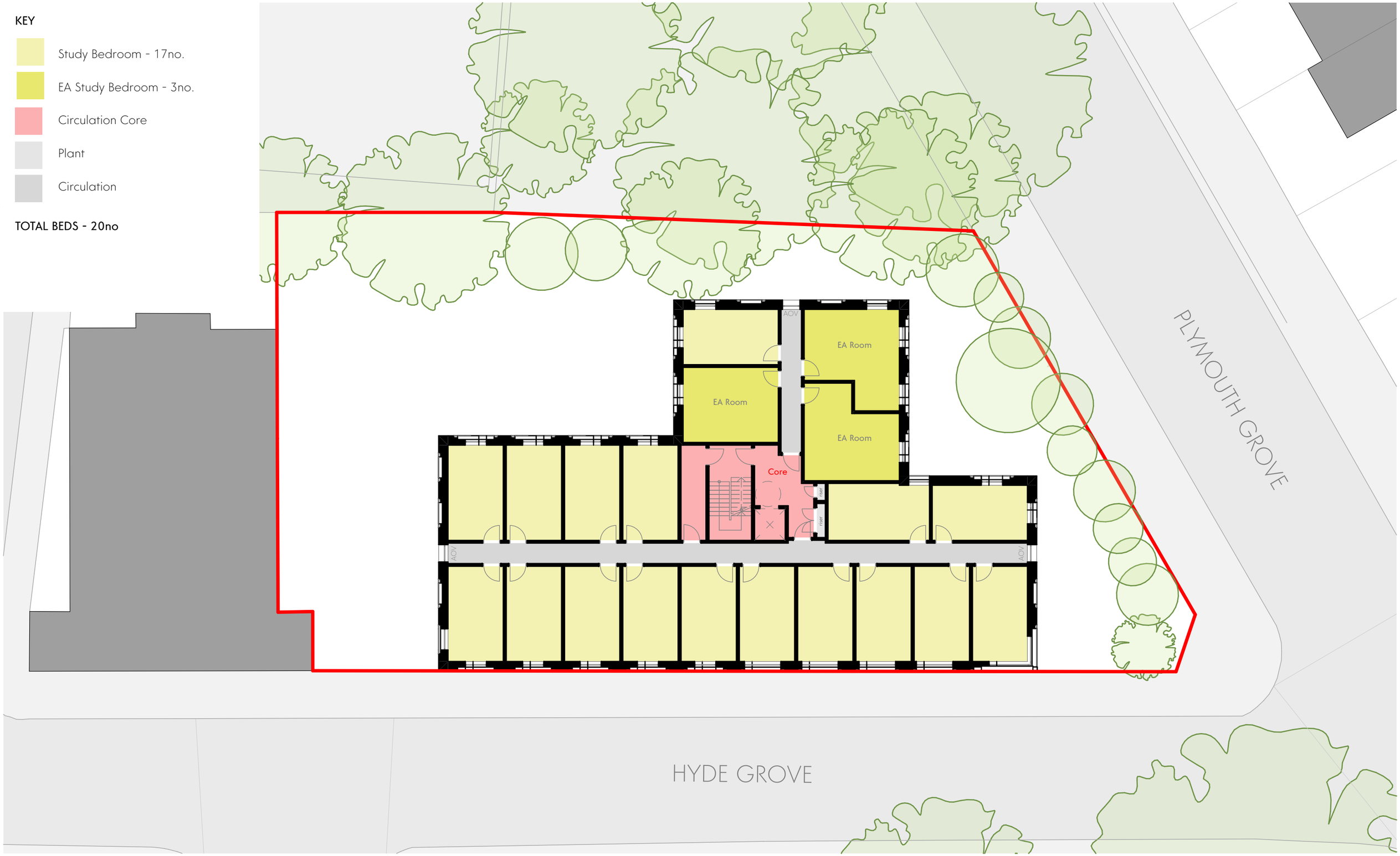
CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane. Leeds LS8 1PQ
+44(0)113 266 6044 (t) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

KEY

- Study Bedroom - 17no.
- EA Study Bedroom - 3no.
- Circulation Core
- Plant
- Circulation

TOTAL BEDS - 20no



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Rev	Date	Comment	Dr	Ch
P06	30.10.24	General update	JW	RT
P05	10.09.24	Updated as Studio scheme	TA	RT
P04	09.08.24	Update as planning comments	JH	TA
P03	02.05.24	Updated as planning comment	TA	RT
P02	21.03.24	Updated to cluster scheme	TA	RT
P01	15.02.24	First Issue	TA	RT

/Volumes/Data/CAD/(544)2337 Renshaw House, Manchester/A_Architects_(GWP)/Model/Renshaw House, Manchester - (544)2337-GWP-01-XX-M3-A-RenshawHouse-StudioReducedHeightOption2-P10.pln

GWP Job Reference (544)2337

Job Title Renshaw House, Hyde

Client Mia James Construction

Proposed First Floor Plan

Name	(544)2337-GWP-01-01-D-A-(PA)-0010
Scale 1:200@A3	Revision P06
Drawn/Checked MH / TA	First Issue 15.02.24
Drawing Status	A - Approval

CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane. Leeds LS8 1PQ
+44(0)113 266 6044 (t) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

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P04	02.05.24	Updated as planning comment	TA	RT
P03	21.03.24	Updated to cluster scheme	TA	RT
P02	23.02.24	PV added, terrace omitted	TA	RT
P01	15.02.24	First Issue	TA	RT

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GWP Job Reference (544)2337

Job Title Renshaw House, Hyde

Client Mia James Construction

Proposed Roof Plan

Name	(544)2337-GWP-01-RL-D-A-(PA)-0015		
Scale	1:200@A3	Revision	P07
Drawn/Checked	TA / RT	First Issue	16.02.24
Drawing Status	A - Approval		

CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane. Leeds LS8 1PQ
+44(0)113 266 6044 (t) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

APPENDIX B

TOPOGRAPHICAL SURVEY

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GWP Job Reference (544)2337

Job Title Renshaw House, Hyde

Client Mia James Construction

Proposed Roof Plan

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Scale	1:200@A3	Revision	P07
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CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

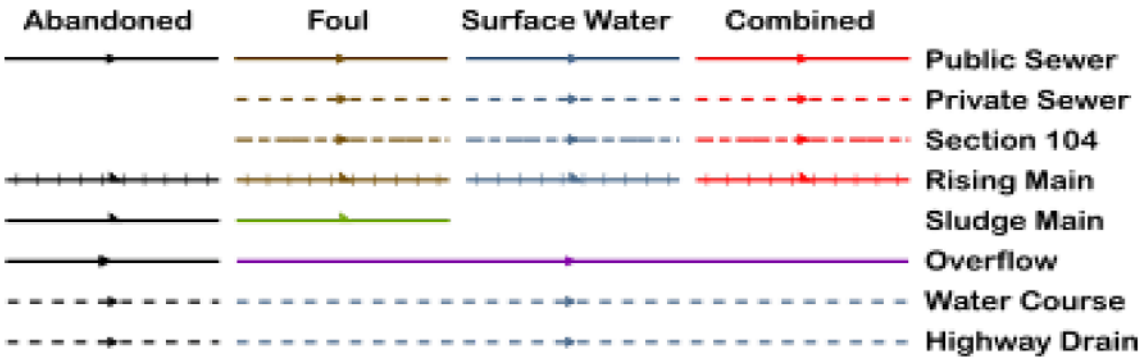
Bracken House, Lidgett Lane. Leeds LS8 1PQ
+44(0)113 266 6044 (t) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

APPENDIX C

UTILITIES SURVEY

United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

Scale: 1:1250 **Date:** 22/02/2024	**SEWER RECORDS**	United Utilities Water for the North West
Address or Site Reference: 231008 **Printed by:** Property Searches		

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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United Utilities
Water for the North West

Clean Water Symbology

Proposed	Abandoned	Live	
			Distribution Main
			Trunk Main
			Comms Pipe
			Private Pipe
			Concessionary Service
			Raw Water
			LDTM Raw Water
			LDTM Treated Water

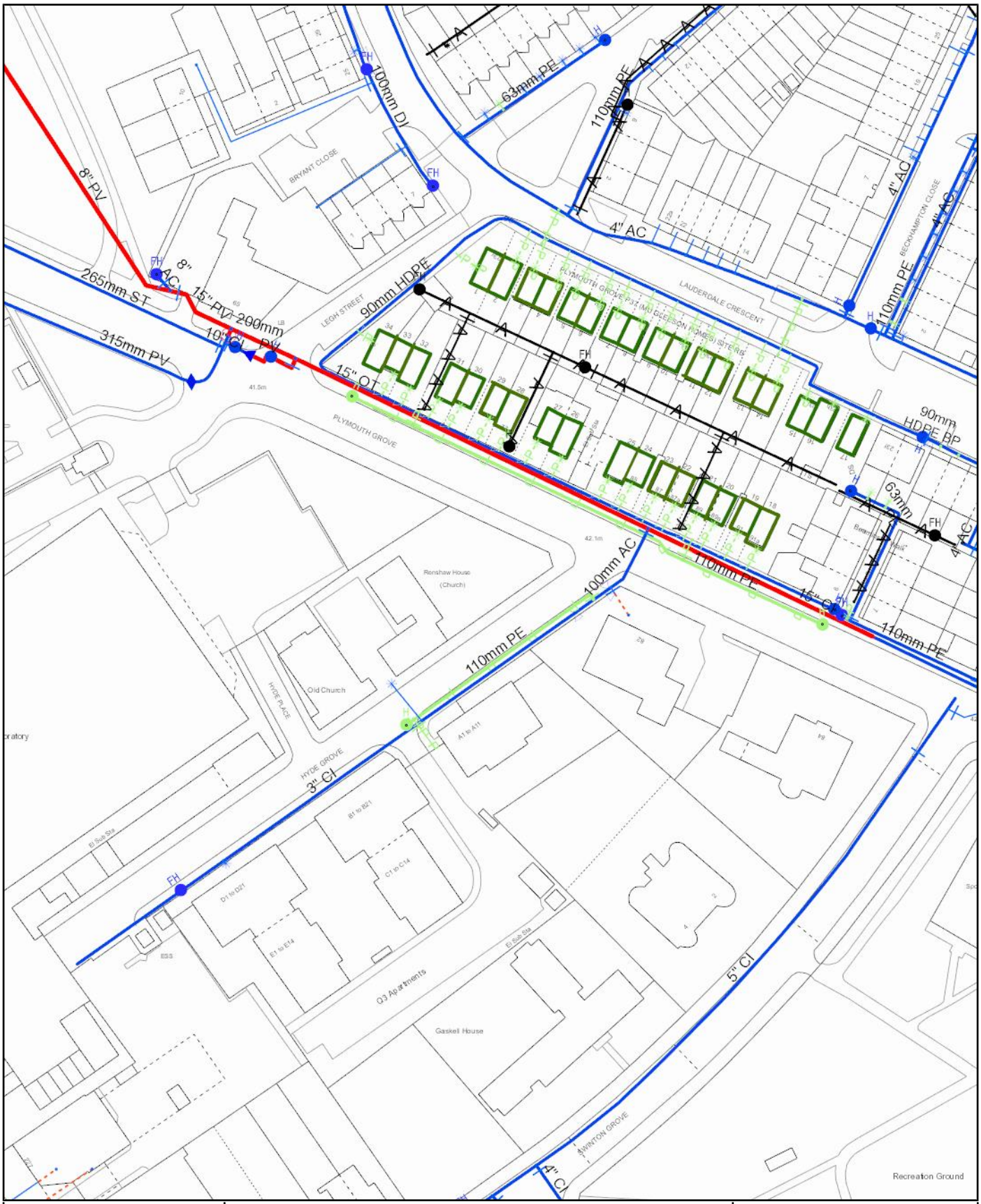
- Air Valve
- AC Valve, open
- AC Valve, closed
- CC Valve, open
- CC Valve, closed
- Non Return Valve
- Pressure Management Valve
- OMS Valve
- Stop Tap
- Flow Meter
- Domestic Meter
- Commercial Meter
- Pump
- Hydrant
- Fire Hydrant
- Anode
- Chlorination Point
- De-chlorination Point
- Strainer Point
- Access Point
- Hatch Box
- IP Point
- Sampling Station
- Logger Box

- Bore Hole
- Inlet Point
- Bulk Supply Point
- End Cap
- Site Termination
- Change of Characteristic
- Condition Report

Property Types

- Water Tower
- Valve House
- Booster Pumping Station
- Intake Pumping Station
- Water Treatment Works
- Supply Reservoir
- Service Reservoir
- Impounding Reservoir
- Pipe Bridge

Symbology for proposed assets is the same as above, but shown in green
Symbology for abandoned assets is the same as above, but shown in black



Scale: 1:1250 **Date:** 22/02/2024	**WATER MAINS RECORDS**	United Utilities Water for the North West
Address or Site Reference: 231008 **Printed by:** Property Searches		

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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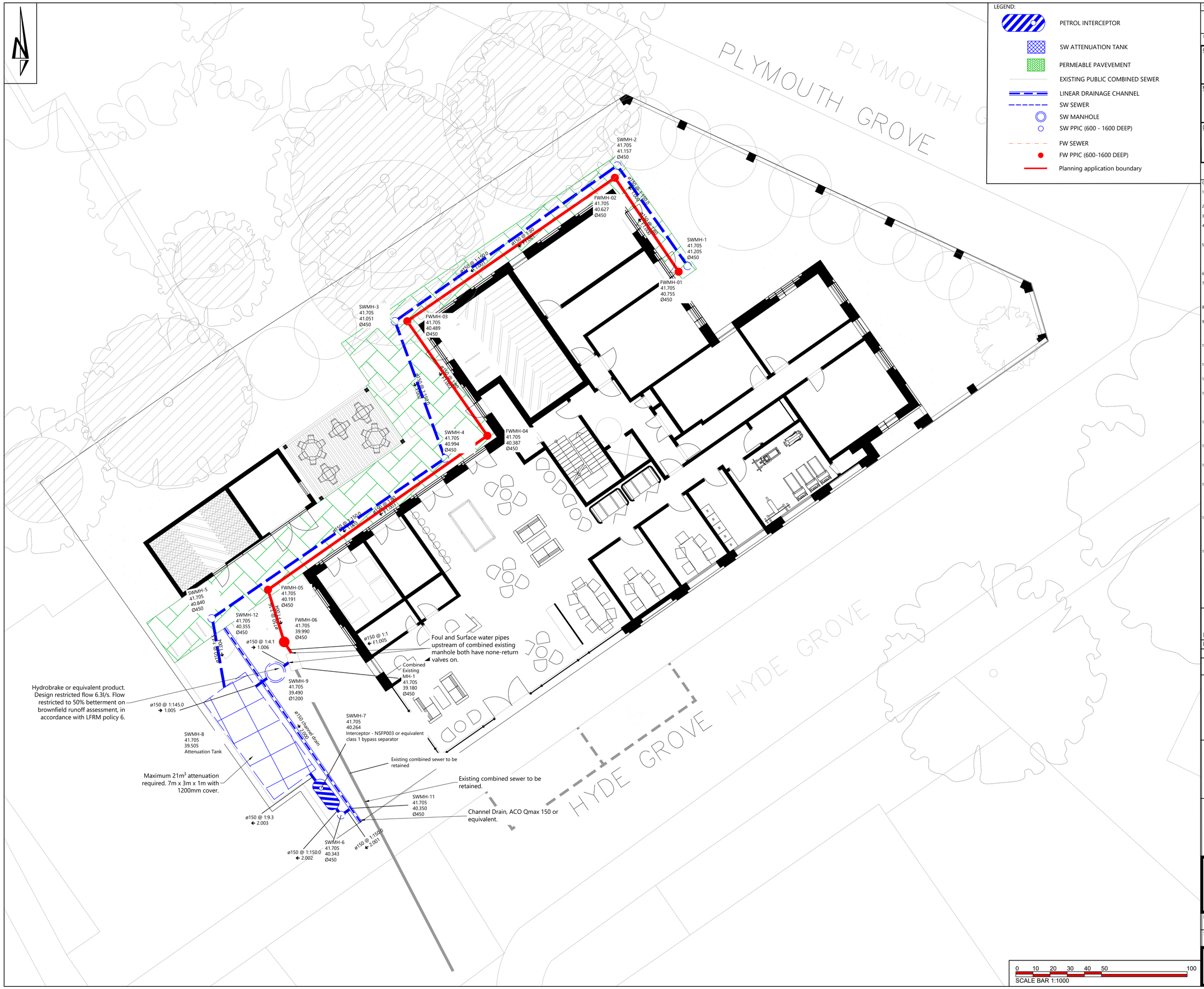
APPENDIX D

DRAINAGE STRATEGY



LEGEND:

- PETROL INTERCEPTOR
- SW ATTENUATION TANK
- PERMEABLE PAVEVEMENT
- EXISTING PUBLIC COMBINED SEWER
- LINEAR DRAINAGE CHANNEL
- SW SEWER
- SW MANHOLE
- SW PPIC (600 - 1600 DEEP)
- FW SEWER
- FW PPIC (600-1600 DEEP)
- Planning application boundary

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION

MAINTENANCE

DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

GENERAL NOTES:

1. This drawing shall be read in conjunction with all the relevant architects, engineers' and service engineers drawings & specifications.
2. All units in millimeters U.O.N. on the drawing. Do not scale off the drawing.
3. All temporary works for formwork, excavations etc., to be the design responsibility of the Contractor.
4. The Contractor shall allow for the protection, temporary and permanent support and diversion works as necessary, to all existing services to the satisfaction of the asset owners.
5. The Contractor shall allow for dealing with surface water run-off into excavations and from groundwater by means of sumps, pumping and de-watering as appropriate, in order to keep the excavation as reasonably dry as possible during the construction of the works.
6. The Contractor is responsible for obtaining all required permits and licenses.
7. All private drainage within the site is to comply with the requirements of the relevant British/European Standard, (including BS EN 752, BS EN 1610, BS EN 295, BS EN 1917, BS5911, BS8000-0 & 14 and BS EN 124), and the Building Regulations Part H.
8. Any adoptable drainage is to be in accordance with the requirements of the adopting authority. If in doubt seek clarification.
9. All pipework within chambers are to be laid soffit to soffit (U.O.N). All chamber invert levels are for the outgoing pipe levels. Backdrop pipework shall be connected at soffit to soffit with the backdrop / rodding access level specified.
10. Catchpit invert levels are for the outgoing pipe, pipes to be soffits level, sump level specified separately. All Catchpits are to be built with a 300 sump (U.O.N).
11. Any gradients of drains indicated are indicative only and the Contractor shall install the drains to the specified levels shown for each chamber (U.O.N).
12. Cover levels of the access points are provisional and subject to adjustment on site to suit the finished ground levels.
13. Positions and sizes of above ground foul and surface water drainage connections ("pop-ups") are indicative only. Setting out and confirmation of the internal requirements is the responsibility of the Architect. Contractor to confirm requirement prior to construction.
14. Ø of PCC manholes varies with pipe size, number of connections, depth etc. Minimum sizes are shown on the Burrows Graham Standard Details drawings. Sizes shown on drainage layout and/or manhole schedules take precedence over minimum sizes.
15. Flow control chambers should be built in accordance with the requirement of the manufacturer. Allowance should be made for a 400mm sump and double covers and frames on the chambers.
16. Insitu concrete grades to be as stated on the drawings. Design chemical class for all precast concrete products shall be DC4 unless agreed otherwise.
17. All separators shall be in accordance with Building Regulations Part H3-A and with BS EN 858 and be kite-marked / CE- marked in accordingly. The oil alarm system is to be in accordance with Client's requirements. Separators to be installed in accordance with manufacturer's recommendations / requirements (venting, protection etc).
18. All below ground plastic/GRP tanks shall be installed in accordance with the manufacturers instructions / requirements. They shall be provided with sufficient concrete surround to counter floatation and shall have a wall thickness adequate to resist the highest ground water level which could be encountered at their location.
19. All existing drainage/structures to be abandoned shall be broken out and removed from site, the excavation shall be backfilled with a suitable granular material to the required level. Alternatively, deep drains may be cleaned and grouted with a 1:10 cementitious grout, with structures broken down to 1m below proposed finished ground level and infilled with a suitable granular material. Abandoned gullies are to be removed from site and abandoned tails are to be sealed with a 300 thick concrete plug at a depth of 1.0m below proposed finished ground level.
20. Where utility/land drainage trenches etc cross over drainage trenches, the Contractor shall construct an impermeable barrier to prevent groundwater infiltrating into the drainage trench.
21. Design assumes that no sewerage authority sewers or other drainage systems require modification, diversion or abandoning (U.O.N on the drawings)
22. All manholes less than 1.5m deep are considered as none man entry and shall be maintained from ground level.
23. Upon completion of the works, the Contractor shall clean all drainage by jetting, removing all debris from site and the system is to be CCTV surveyed. No debris shall be permitted to enter the existing drainage system.
24. No deep rooting trees/vegetation should be planted within 5.0m of any drainage works.
25. The storage and installation of all proprietary drainage items used are to be strictly in accordance with the manufacturers instructions / requirements.
26. Any works within the public highway to be reinstated to highway authority requirements. All relevant permits/licences must be sought by the contractor prior to the works being undertaken.
27. Statutory Undertakers information, where shown, is indicative only based on supplied records. The contractor shall verify the depth position and nature of the services as necessary in order to construct the works.
28. Drainage channels are to be ACO Qmax in service yards and ACO Multidrain in car parks, or similar approved. Channels are to be sized by the supplier and approved by the Engineer in writing prior to ordering. Drainage channels to be installed to manufacturers' requirements. Design of channels shall be based on a 1 in 30 year storm return period, 15 minute duration. Outlet units on channel drains to include silt traps.
29. All RWP, gully and channel connections shall be Ø150 U.O.N. Waste/soil stack connections shall be Ø100mm. U.O.N and shall have internal above ground rodding eyes or large access fittings in accordance with Building Regulations.
30. All WPC's, SRWP's and RWP's are shown indicatively. Locations shall be confirmed by others.
31. Below ground drainage connections to be provided to all canopy downpipes
31.1. Ø150mm with concrete bed and surround U.O.N.
32. Green roof layout shown on separate roof plan (5442337-GWP-01-RL-D-A-(PA)-0015_Proposed Roof Plan - P07. Green roof drains positively into main runs that are shown.

REV	DATE	BY	DESCRIPTION	CHKD
P03	06.11.24	JDL	Issued for Information	JW
P02	16.05.24	JDL	Issued for Information	JW
P01	22.03.24	JDL	Issued for Information	JW

Burrows Graham

North Office:
5 Ambassador Place, Stockport Road,
Altrincham WA15 8DB
Tel: +44 (0)161 804 8046

South Office:
Buckland House, Dower Mews,
High Street, Berkhamsted HP4 2BL
Tel: +44 (0)1442 508 402

CLIENT

MIA JAMES CONSTRUCTION & INTERIORS

PROJECT

RENSHAW HOUSE

DRAWING TITLE

Proposed Surface Water Drainage Strategy

BGL PROJECT NUMBER	DRAWING STATUS	OFFICE	
30094	PRELIMINARY	NORTH	
SCALE @ A1	DATE	DRAWN BY	CHECKED BY
1:100	22 03 2024	JDL	JW

DRAWING No: 30094-BGL-XX-XX-DR-C-00250

REV: P03

APPENDIX E

HYDRAULIC CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	20	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	15.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.016	15.00	41.705	450	0.500
2	0.010	15.00	41.705	450	0.548
3	0.017	15.00	41.705	450	0.654
4	0.022	15.00	41.705	450	0.711
5	0.011	15.00	41.705	450	0.865
6			41.705	450	1.362
7	0.007	15.00	41.705		1.441
8			41.705	450	2.200
9			41.705	1200	2.215
Combined Existing MH-1			41.705	450	2.525
11			41.705	450	1.355
12	0.005	15.00	41.705	450	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	7.151	0.600	41.205	41.157	0.048	150.0	150	15.15	50.0
1.001	2	3	15.837	0.600	41.157	41.051	0.106	150.0	150	15.47	50.0
1.002	3	4	8.519	0.600	41.051	40.994	0.057	150.0	150	15.64	50.0
1.003	4	5	13.669	0.600	40.994	40.903	0.091	150.0	150	15.92	50.0
1.004	5	8	6.019	0.600	40.840	39.505	1.335	4.5	150	15.94	50.0
2.000	12	11	10.617	0.600	40.355	40.350	0.005	2123.4	150	15.84	50.0
2.001	11	6	1.101	0.600	40.350	40.343	0.007	150.0	150	15.87	50.0
2.002	6	7	1.956	0.600	40.343	40.330	0.013	150.0	150	15.91	50.0
2.003	7	8	7.094	0.600	40.264	39.505	0.759	9.3	150	15.94	50.0
1.005	8	9	2.175	0.600	39.505	39.490	0.015	145.0	150	15.99	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.818	14.5	2.2	0.350	0.398	0.016	0.0	40	0.592
1.001	0.818	14.5	3.5	0.398	0.504	0.026	0.0	51	0.678
1.002	0.818	14.5	5.9	0.504	0.561	0.043	0.0	67	0.776
1.003	0.818	14.5	8.8	0.561	0.652	0.065	0.0	85	0.858
1.004	4.779	84.4	10.3	0.715	2.050	0.076	0.0	35	3.263
2.000	0.210	3.7	0.7	1.200	1.205	0.005	0.0	44	0.160
2.001	0.818	14.5	0.7	1.205	1.212	0.005	0.0	23	0.421
2.002	0.818	14.5	0.7	1.212	1.225	0.005	0.0	23	0.421
2.003	3.315	58.6	1.6	1.291	2.050	0.012	0.0	17	1.456
1.005	0.832	14.7	11.9	2.050	2.065	0.088	0.0	103	0.926

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.006	9	Combined Existing MH-1	1.258	0.600	39.490	39.180	0.310	4.1	150	15.99	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.006	5.038	89.0	11.9	2.065	2.375	0.088	0.0	37	3.537

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	7.151	150.0	150	Circular	41.705	41.205	0.350	41.705	41.157	0.398
1.001	15.837	150.0	150	Circular	41.705	41.157	0.398	41.705	41.051	0.504
1.002	8.519	150.0	150	Circular	41.705	41.051	0.504	41.705	40.994	0.561
1.003	13.669	150.0	150	Circular	41.705	40.994	0.561	41.705	40.903	0.652
1.004	6.019	4.5	150	Circular	41.705	40.840	0.715	41.705	39.505	2.050
2.000	10.617	2123.4	150	Circular	41.705	40.355	1.200	41.705	40.350	1.205
2.001	1.101	150.0	150	Circular	41.705	40.350	1.205	41.705	40.343	1.212
2.002	1.956	150.0	150	Circular	41.705	40.343	1.212	41.705	40.330	1.225
2.003	7.094	9.3	150	Circular	41.705	40.264	1.291	41.705	39.505	2.050
1.005	2.175	145.0	150	Circular	41.705	39.505	2.050	41.705	39.490	2.065
1.006	1.258	4.1	150	Circular	41.705	39.490	2.065	41.705	39.180	2.375

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	450	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	3	450	Manhole	Adoptable
1.002	3	450	Manhole	Adoptable	4	450	Manhole	Adoptable
1.003	4	450	Manhole	Adoptable	5	450	Manhole	Adoptable
1.004	5	450	Manhole	Adoptable	8	450	Manhole	Adoptable
2.000	12	450	Manhole	Adoptable	11	450	Manhole	Adoptable
2.001	11	450	Manhole	Adoptable	6	450	Manhole	Adoptable
2.002	6	450	Manhole	Adoptable	7		Junction	
2.003	7		Junction		8	450	Manhole	Adoptable
1.005	8	450	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.006	9	1200	Manhole	Adoptable	Combined Existing MH-1	450	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
1	41.705	0.500	450		0	1.000	41.205	150
2	41.705	0.548	450		1	1.000	41.157	150
					0	1.001	41.157	150
3	41.705	0.654	450		1	1.001	41.051	150
					0	1.002	41.051	150

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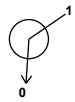
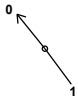
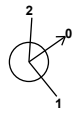
Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
4	41.705	0.711	450		1	1.002	40.994	150
					0	1.003	40.994	150
5	41.705	0.865	450		1	1.003	40.903	150
					0	1.004	40.840	150
6	41.705	1.362	450		1	2.001	40.343	150
					0	2.002	40.343	150
7	41.705	1.441			1	2.002	40.330	150
					0	2.003	40.264	150
8	41.705	2.200	450		1	2.003	39.505	150
					2	1.004	39.505	150
					0	1.005	39.505	150
9	41.705	2.215	1200		1	1.005	39.490	150
					0	1.006	39.490	150
Combined Existing MH-1	41.705	2.525	450		1	1.006	39.180	150
11	41.705	1.355	450		1	2.000	40.350	150
					0	2.001	40.350	150
12	41.705	1.350	450		0	2.000	40.355	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	30	0	0

Node 9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.006	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0101-6300-2215-6300
Invert Level (m)	39.490	Min Outlet Diameter (m)	0.150
Design Depth (m)	2.215	Min Node Diameter (mm)	1200
Design Flow (l/s)	6.3		

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.180
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	80

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	1.000	20.0	0.0	1.001	0.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	21	41.234	0.029	1.2	0.0240	0.0000	OK
30 minute winter	2	23	41.194	0.037	1.9	0.0186	0.0000	OK
30 minute winter	3	23	41.100	0.049	3.2	0.0339	0.0000	OK
30 minute winter	4	24	41.056	0.062	4.8	0.0478	0.0000	OK
30 minute winter	5	24	40.866	0.026	5.6	0.0105	0.0000	OK
30 minute winter	6	26	40.361	0.018	0.4	0.0028	0.0000	OK
30 minute winter	7	26	40.277	0.013	0.9	0.0013	0.0000	OK
30 minute winter	8	30	39.640	0.135	6.5	2.5707	0.0000	OK
30 minute winter	9	31	39.637	0.147	4.4	0.1666	0.0000	OK
15 minute summer	Combined Existing MH-1	1	39.180	0.000	3.9	0.0000	0.0000	OK
30 minute winter	11	25	40.369	0.019	0.4	0.0030	0.0000	OK
30 minute winter	12	22	40.387	0.032	0.4	0.0075	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	1.2	0.421	0.083	0.0205	
30 minute winter	2	1.001	3	1.9	0.462	0.131	0.0662	
30 minute winter	3	1.002	4	3.2	0.540	0.221	0.0506	
30 minute winter	4	1.003	5	4.8	0.722	0.332	0.0909	
30 minute winter	5	1.004	8	5.6	1.793	0.066	0.0550	
30 minute winter	6	2.002	7	0.4	0.353	0.028	0.0022	
30 minute winter	7	2.003	8	0.9	0.600	0.015	0.0612	
30 minute winter	8	1.005	9	4.4	0.354	0.297	0.0372	
30 minute winter	9	Hydro-Brake®	Combined Existing MH-1	4.3				7.4
30 minute winter	11	2.001	6	0.4	0.331	0.028	0.0013	
30 minute winter	12	2.000	11	0.4	0.204	0.108	0.0213	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	22	41.254	0.049	3.0	0.0397	0.0000	OK
30 minute winter	2	24	41.216	0.059	4.7	0.0297	0.0000	OK
30 minute winter	3	23	41.139	0.088	7.9	0.0604	0.0000	OK
30 minute winter	4	23	41.105	0.111	11.9	0.0859	0.0000	OK
30 minute winter	5	23	40.881	0.041	13.8	0.0165	0.0000	OK
30 minute winter	6	26	40.369	0.026	0.9	0.0042	0.0000	OK
30 minute winter	7	24	40.284	0.020	2.2	0.0019	0.0000	OK
30 minute winter	8	34	40.017	0.512	16.0	9.7932	0.0000	SURCHARGED
30 minute winter	9	34	40.012	0.522	5.8	0.5909	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
30 minute winter	11	26	40.378	0.028	0.9	0.0045	0.0000	OK
30 minute winter	12	26	40.400	0.045	0.9	0.0105	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	3.0	0.533	0.208	0.0403	
30 minute winter	2	1.001	3	4.7	0.555	0.325	0.1352	
30 minute winter	3	1.002	4	7.9	0.638	0.546	0.1051	
30 minute winter	4	1.003	5	11.9	0.893	0.822	0.1818	
30 minute winter	5	1.004	8	13.8	1.894	0.163	0.0646	
30 minute winter	6	2.002	7	0.9	0.447	0.062	0.0039	
30 minute winter	7	2.003	8	2.2	0.625	0.038	0.0673	
30 minute winter	8	1.005	9	5.8	0.386	0.392	0.0383	
30 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.2				18.2
30 minute winter	11	2.001	6	0.9	0.411	0.062	0.0024	
30 minute winter	12	2.000	11	0.9	0.272	0.243	0.0358	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	23	41.262	0.057	4.0	0.0470	0.0000	OK
30 minute winter	2	23	41.226	0.069	6.3	0.0349	0.0000	OK
30 minute winter	3	24	41.180	0.129	10.5	0.0886	0.0000	OK
30 minute winter	4	24	41.149	0.155	15.5	0.1199	0.0000	SURCHARGED
30 minute winter	5	24	40.887	0.047	18.0	0.0189	0.0000	OK
60 minute winter	6	57	40.637	0.294	3.8	0.0468	0.0000	SURCHARGED
60 minute winter	7	57	40.637	0.373	4.6	0.0362	0.0000	SURCHARGED
60 minute winter	8	57	40.637	1.132	17.6	13.0050	0.0000	SURCHARGED
60 minute winter	9	57	40.634	1.144	8.1	1.2933	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
60 minute winter	11	58	40.639	0.289	3.0	0.0459	0.0000	SURCHARGED
60 minute winter	12	57	40.637	0.282	2.3	0.0664	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	4.0	0.569	0.277	0.0503	
30 minute winter	2	1.001	3	6.3	0.569	0.436	0.1895	
30 minute winter	3	1.002	4	10.3	0.644	0.715	0.1435	
30 minute winter	4	1.003	5	15.5	0.940	1.075	0.2198	
30 minute winter	5	1.004	8	18.0	1.991	0.214	0.0671	
60 minute winter	6	2.002	7	-3.8	0.460	-0.263	0.0344	
60 minute winter	7	2.003	8	-3.8	0.625	-0.065	0.1249	
60 minute winter	8	1.005	9	8.1	0.458	0.548	0.0383	
60 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.2				29.8
60 minute winter	11	2.001	6	-3.0	0.422	-0.204	0.0194	
60 minute winter	12	2.000	11	-1.7	0.282	-0.459	0.1869	

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Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	56	41.413	0.208	4.3	0.1703	0.0000	FLOOD RISK
60 minute winter	2	56	41.412	0.255	6.8	0.1295	0.0000	FLOOD RISK
60 minute winter	3	56	41.410	0.359	11.2	0.2471	0.0000	FLOOD RISK
60 minute winter	4	56	41.407	0.413	16.9	0.3195	0.0000	FLOOD RISK
60 minute winter	5	57	41.396	0.556	19.6	0.2241	0.0000	SURCHARGED
60 minute winter	6	56	41.391	1.048	10.7	0.1667	0.0000	SURCHARGED
60 minute winter	7	57	41.390	1.126	12.3	0.1092	0.0000	SURCHARGED
60 minute winter	8	57	41.388	1.883	22.7	13.1245	0.0000	SURCHARGED
60 minute winter	9	57	41.383	1.893	7.7	2.1415	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
60 minute winter	11	57	41.394	1.044	9.0	0.1660	0.0000	SURCHARGED
60 minute winter	12	56	41.392	1.037	7.4	0.2437	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1	1.000	2	4.3	0.577	0.298	0.1259	
60 minute winter	2	1.001	3	6.7	0.567	0.466	0.2788	
60 minute winter	3	1.002	4	11.2	0.644	0.774	0.1500	
60 minute winter	4	1.003	5	16.9	0.975	1.166	0.2406	
60 minute winter	5	1.004	8	19.6	1.838	0.232	0.1060	
60 minute winter	6	2.002	7	-10.7	-0.608	-0.740	0.0344	
60 minute winter	7	2.003	8	-10.6	0.625	-0.180	0.1249	
60 minute winter	8	1.005	9	7.7	0.439	0.525	0.0383	
60 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.9				38.8
60 minute winter	11	2.001	6	-9.0	-0.509	-0.620	0.0194	
60 minute winter	12	2.000	11	-6.1	-0.349	-1.657	0.1869	

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APPENDIX F

DRAINAGE INSPECTION & MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Below Ground Drainage Pipes, Manholes, etc		
Regular Maintenance	Lift covers and inspect manholes for evidence of debris and silt deposits and evidence of blockages (standing water). Carry out CCTV survey if required	Quarterly
Remedial Actions	High pressure jetting and/or remove minor blockages and silt build up	As required – 20% loss of pipe cross-section
	Replace broken access covers, remove major blockages, repair structurally defective pipework	As required
Flow control chamber		
Regular Maintenance	Lift covers and inspect chamber fore evidence of debris and silt deposits and evidence of blockages. Test bypass door operating correctly.	Quarterly
Remedial Actions	High pressure jetting and or remove minor blockages and silt build up	As required
	Replace broken access covers, remove major blockages, repair/replace defective flow control devices	As required
Linear channel drains and gullies		
Regular Maintenance	Lift access covers and inspect for silt/debris accumulation	Quarterly
Remedial Actions	Replace broken access covers, gratings	Annually
	High pressure jetting and/or remove minor blockages and silt build up	As required
Rainwater pipes		
Regular Maintenance	Inspect rainwater goods for evidence of leaking pipework	Monthly (or as required)
Occasional Maintenance	Remove rodding eyes and carry out high pressure jetting to remove any debris	Quarterly
Remedial Actions	Replace cracked / leaking pipework	As required
Attenuation Tank (Maintenance activities recommended by the manufacturer should be added to this schedule where not included)		
Regular maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Six monthly
	Change the filter media	As recommended by manufacturer
Remedial actions	Replace malfunctioning parts or structures	As required

Maintenance Schedule	Required Action	Typical Frequency
Monitoring	Inspect for evidence of poor performance	Six monthly
	Inspect sediment accumulation rates and filter media, and establish appropriate replacement frequencies.	Monthly during first half of the year, then every six months

For specialist parts such as petrol interceptor follow supplier guidelines for maintenance.